CEL

BIPOLAR DIGITAL INTEGRATED CIRCUIT
UPB1510GV

3.0 GHz INPUT DIVIDE BY 4 PRESCALER IC FOR DBS TUNERS

DESCRIPTION

The UPB1510GV is a 3.0 GHz input divide by 4 prescaler IC for DBS tuner applications. This IC is suitable for use of frequency divider for PLL synthesizer block. This IC is a shrink package version of the μPB585G so that this small package contributes to reduce the mounting space.

This IC is manufactured using our 20 GHz f_T NESAT IV silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

FEATURES

- High operating frequency : f_{in} = 0.5 to 3.0 GHz
- High-density surface mounting : 8-pin plastic SSOP (4.45 mm (175))
- Low current consumption : I_{CC} = 14 mA TYP. @ V_{CC} = 5 V
- Fixed division : ÷ 4

APPLICATIONS

- Prescaler between local oscillator and PLL frequency synthesizer included modulus prescaler
- DBS tuners with kit use of VHF/UHF band PLL frequency synthesizer

ORDERING INFORMATION (Solder Contains Lead)

Part Number	Package	Marking	Supplying Form
μPB1510GV-E1	8-pin plastic SSOP (4.45 mm (175))	1510	• Embossed tape 8 mm wide • Pin 1 indicates pull-out direction of tape • Qty 1 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPB1510GV

ORDERING INFORMATION (Pb-Free)

Part Number	Package	Marking	Supplying Form
μPB1510GV-E1-A	8-pin plastic SSOP (4.45 mm (175))	1510	• Embossed tape 8 mm wide • Pin 1 indicates pull-out direction of tape • Qty 1 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPB1510GV

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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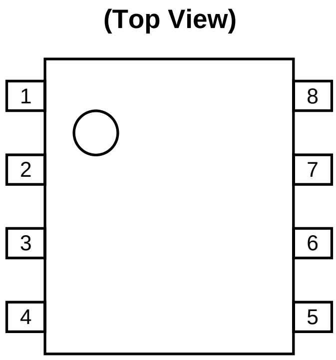
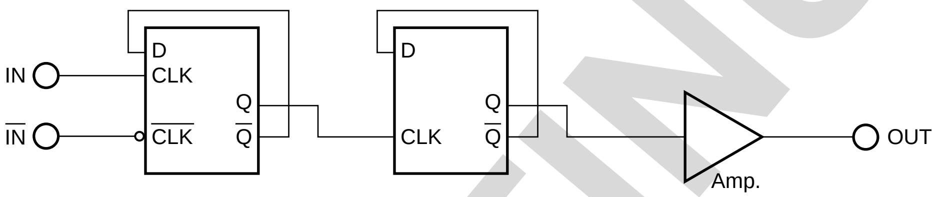
The mark ★ shows major revised points.

PIN CONNECTIONS



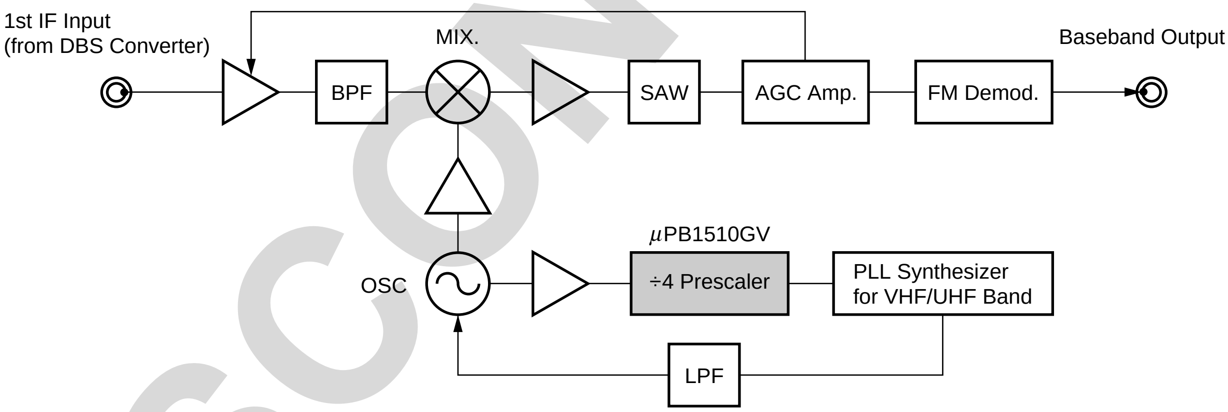
Pin No.	Pin Name
1	V_{CC}
2	IN
3	$\overline{IN}$
4	GND
5	GND
6	NC
7	OUT
8	NC

INTERNAL BLOCK DIAGRAM



SYSTEM APPLICATION EXAMPLE

RF unit block of DBS tuners



PIN EXPLANATION

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V)	Function and Application
1	V_{CC}	4.5 to 5.5	–	Supply voltage pin. This pin must be equipped with bypass capacitor (example: 1 000 pF) to minimize ground impedance.
2	IN	–	1.7 to 4.95	Signal input pin. This pin should be coupled to signal source with capacitor (example: 1 000 pF) for DC cut.
3	$\overline{IN}$	–	1.7 to 4.95	Signal input bypass pin. This pin must be equipped with bypass capacitor (example: 1 000 pF) to minimize ground impedance.
4, 5	GND	0	–	Ground pin. Ground pattern on the board should be formed as wide as possible to minimize ground impedance.
6, 8	NC	–	–	Non connection pins. These pins should be opened.
7	OUT	–	1.0 to 4.7	Divided frequency output pin. This pin is designed as emitter follower output. This pin can be connected to input of prescaler within PLL synthesizer through DC cut capacitor.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	6.0	V
Power Dissipation	P_D	T_A = +85°C **Note**	250	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB

RECOMMENDED OPERATING RANGE

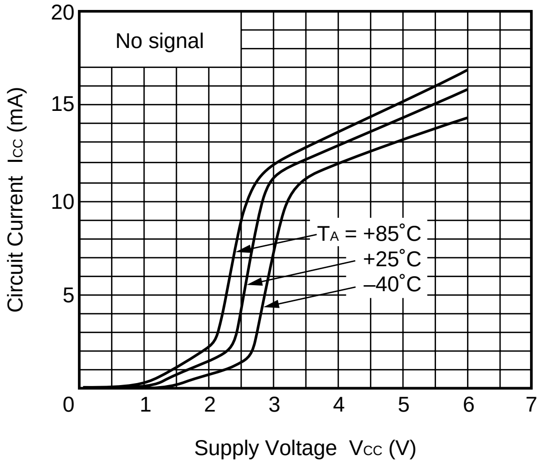
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (T_A = –40 to +85°C, V_{CC} = 4.5 to 5.5 V, Z_S = Z_L = 50 Ω)

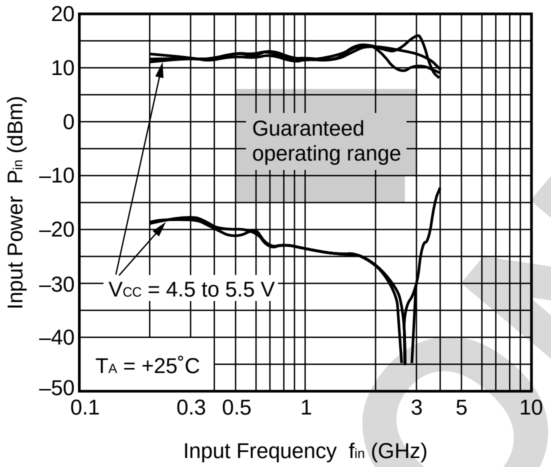
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No Signals	10.5	14	17	mA
Upper Limit Operating Frequency 1	$f_{in\,(U)1}$	P_{in} = –10 to +6 dBm	3.0	–	–	GHz
Upper Limit Operating Frequency 2	$f_{in\,(U)2}$	P_{in} = –15 to +6 dBm	2.7	–	–	GHz
Lower Limit Operating Frequency	$f_{in\,(L)}$	P_{in} = –15 to +6 dBm	–	–	0.5	GHz
Input Power 1	P_{in1}	f_{in} = 2.7 to 3.0 GHz	–10	–	+6	dBm
Input Power 2	P_{in2}	f_{in} = 0.5 to 2.7 GHz	–15	–	+6	dBm
Output Power	P_{out}	P_{in} = 0 dBm, f_{in} = 2.0 GHz	–12	–7	–	dBm

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 5 V, unless otherwise specified)

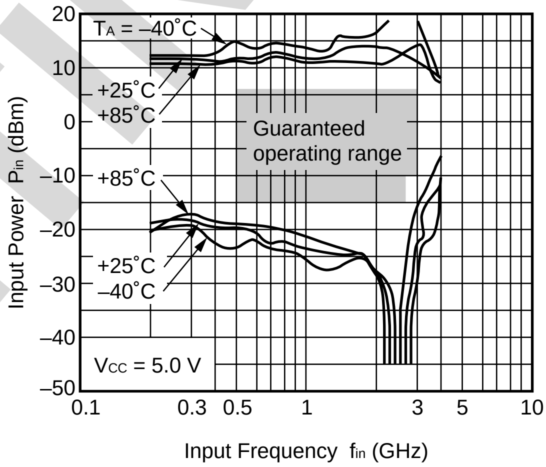
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



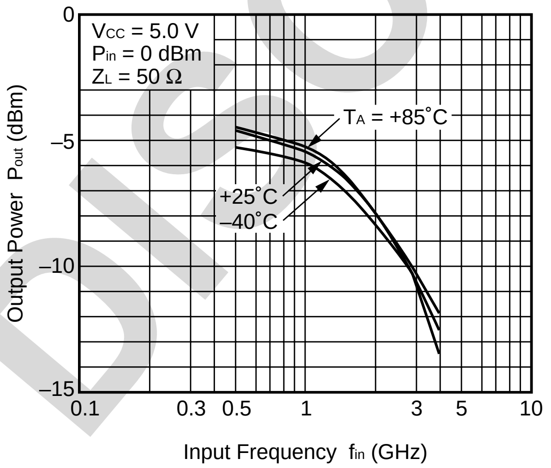
INPUT POWER vs. INPUT FREQUENCY



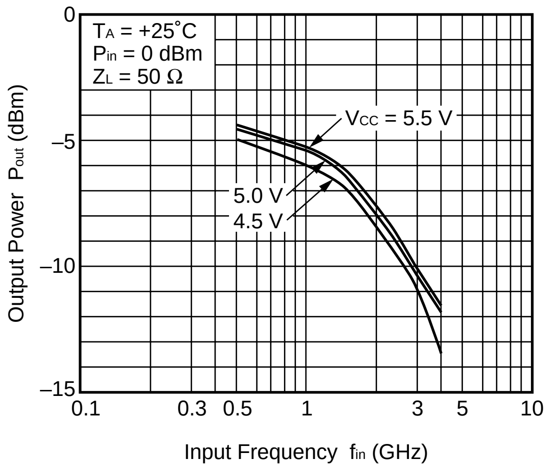
INPUT POWER vs. INPUT FREQUENCY



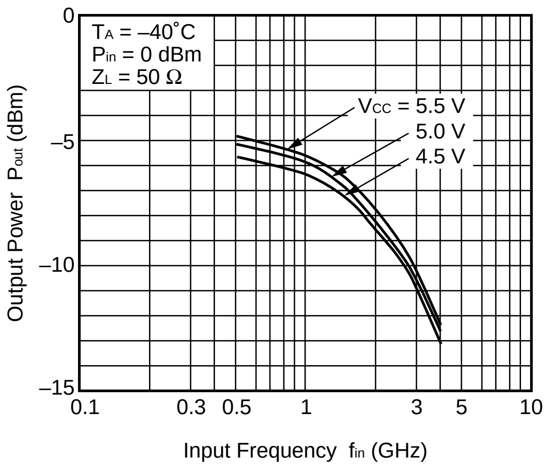
OUTPUT POWER vs. INPUT FREQUENCY



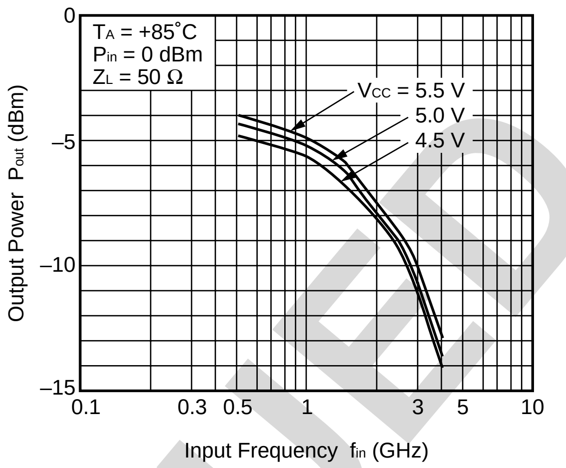
OUTPUT POWER vs. INPUT FREQUENCY



OUTPUT POWER vs. INPUT FREQUENCY



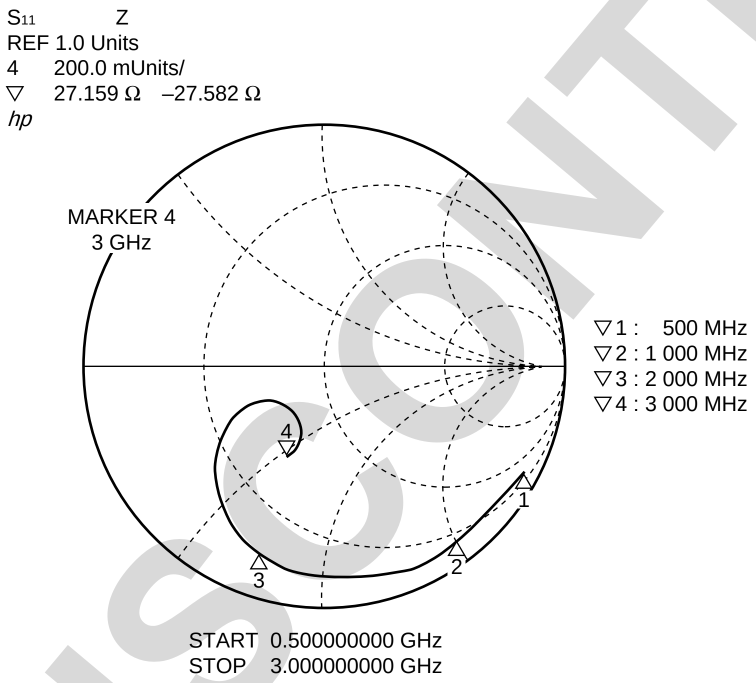
OUTPUT POWER vs. INPUT FREQUENCY



Remark The graphs indicate nominal characteristics.

S_{11} vs. INPUT FREQUENCY

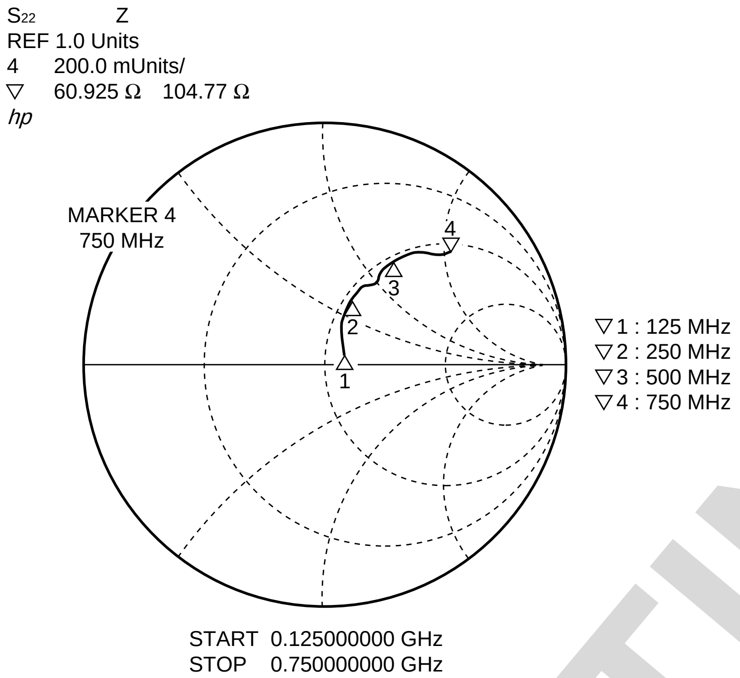
V_{CC} = 5.0 V, T_A = +25°C, Z_O = 50 Ω



Frequency (MHz)	S_{11} (Ω)
500	37.1–j207.8
1 000	14.2–j105.1
2 000	7.9–j35.8
3 000	27.1–j27.5

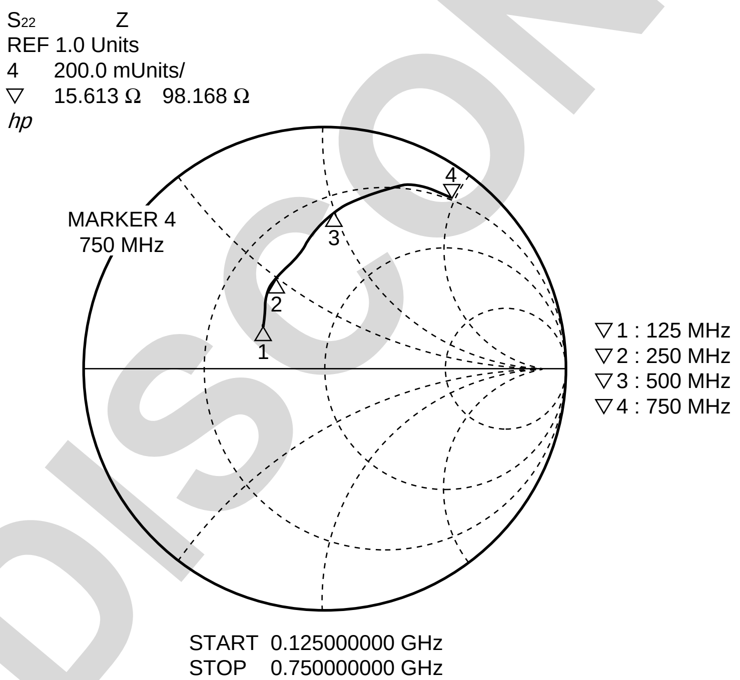
S_{22} vs. OUTPUT FREQUENCY

V_{CC} = 5.0 V, f_{in} = 500 MHz, T_A = +25°C, Z_O = 50 Ω



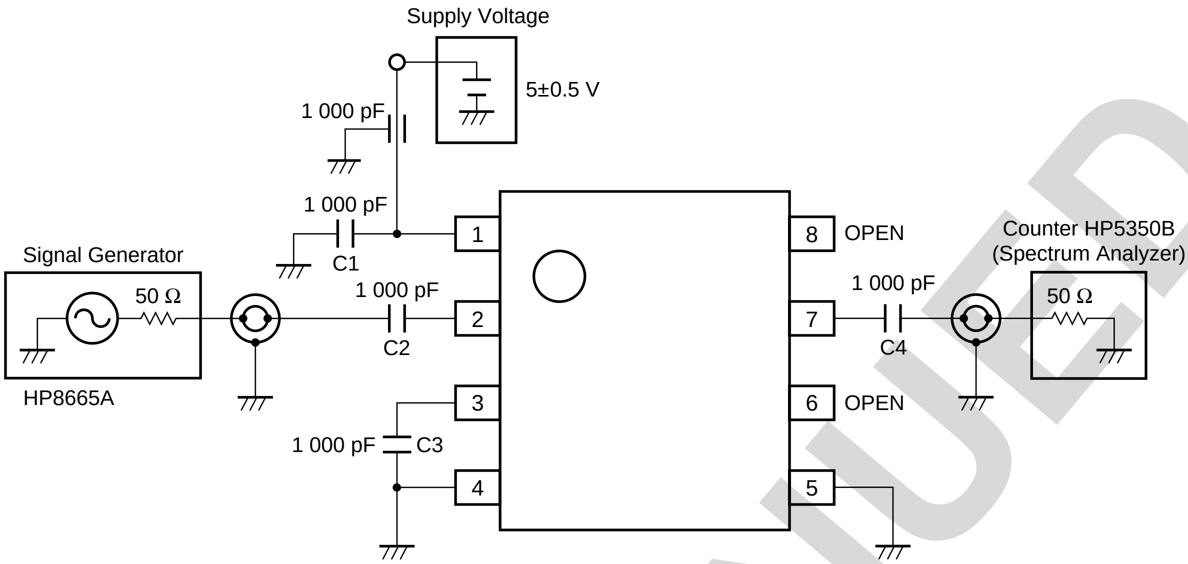
Frequency (MHz)	S_{22} (Ω)
125	55.5+j6.7
250	53.7+j30.4
500	55.0+j60.3
750	60.9+j104.8

V_{CC} = 5.0 V, f_{in} = 3.0 GHz, T_A = +25°C, Z_O = 50 Ω



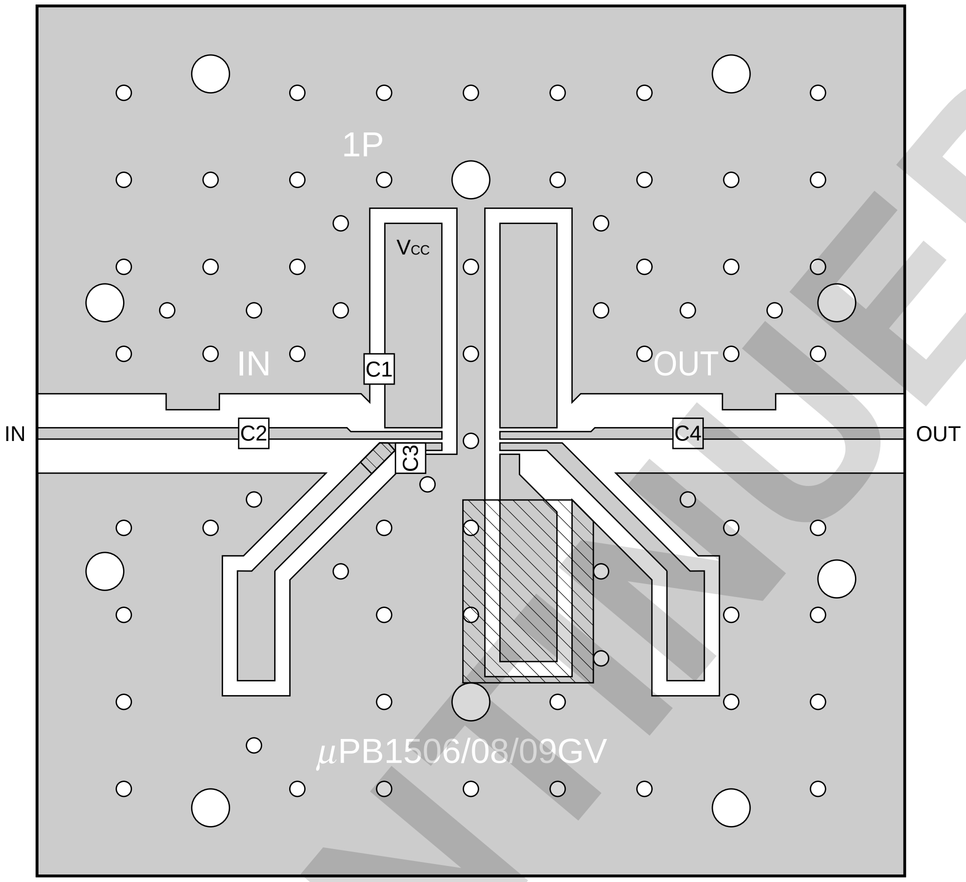
Frequency (MHz)	S_{22} (Ω)
125	28.5+j11.5
250	27.6+j23.6
500	20.5+j50.7
750	15.6+j98.2

TEST CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

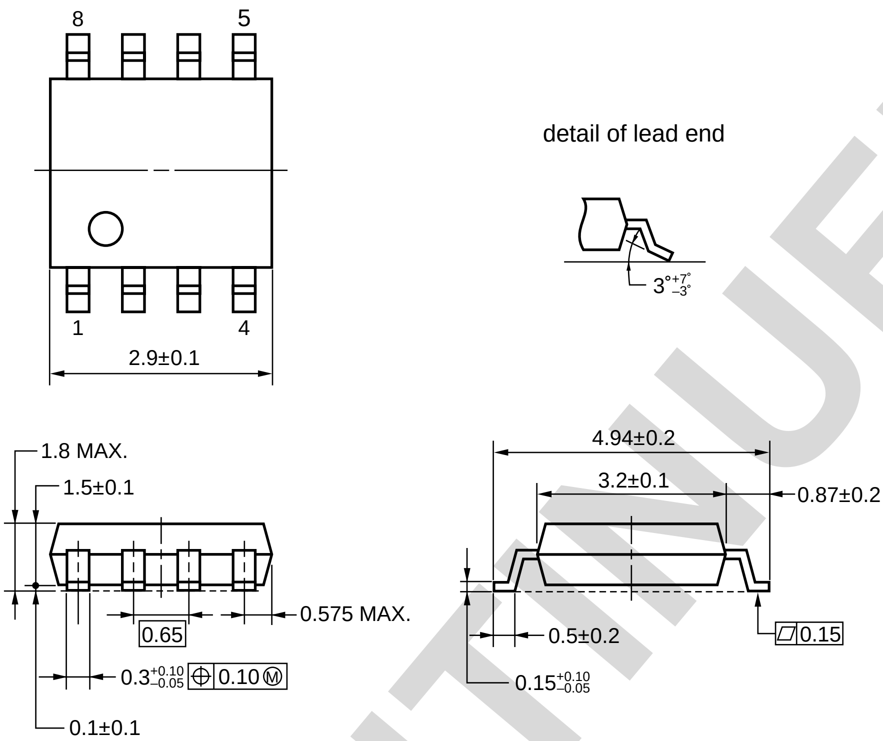
	Value
C1 to C4	1 000 pF

Notes

(1) 35 μm thick double-sided copper-clad 50 × 50 × 0.4 mm polyimide board.
(2) Back side : GND pattern
(3) Solder plated on pattern
(4) ○ ◯ : Through holes
(5) ▧ of pin 3 : Pattern should be removed.
(6) ▧ of pin 5 : Short chip must be attached to be grounded.

★ **PACKAGE DIMENSIONS**

8-PIN PLASTIC SSOP (4.45 mm (175)) (UNIT: mm)



NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.
(2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).
(3) Keep the wiring length of the ground pins as short as possible.
(4) Connect a bypass capacitor (example: 1 000 pF) to the V_{CC} pin.

★ RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
VPS	Peak temperature (package surface temperature) Time at temperature of 200°C or higher Preheating time at 120 to 150°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 215°C or below : 25 to 40 seconds : 30 to 60 seconds : 3 times : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

Caution Do not use different soldering methods together (except for partial heating).